CLAIMS

1. An apparatus for arbitrating service between contending multiple scheduled events having a predefined service delivery priority and a preset delay factor, said apparatus comprising:

queuing means to place sequential items in per sequence queues;

scheduling means to determine sequence service times and to group sequences of similar service quality;

aging means to monitor sequence groups and to record aging components for each group, each of said aging components representing the largest delay suffered by sequences in said group; and

servicing means to selectively service a sequence having the highest aggregate of service priority and aging component.

2. An apparatus as defined in claim 1 wherein said delay factor corresponds directly to Cell Delay Variation (CDV).

3. An apparatus as defined in claim 1 wherein said delay factor relates to maximum Cell Transfer Delay (maxCTD).

4. An apparatus for arbitrating between service connections at a contention point in an ATM network, said service connections including multiple service categories each with predefined quality of service guarantees, said apparatus comprising:

queuing means for arranging sequential items in per sequence queues;

scheduling means to determine sequence service times and to group sequences of similar service quality;

aging means to monitor sequence groups and to introduce aging markers to sequence groups that have been waiting beyond set thresholds to send; and

servicing means to selectively service a sequence having the highest aggregate of service priorities and aging markers.

5. An apparatus as defined in claim 1 wherein said scheduling means includes multiple shaping means.

6. An apparatus as defined in claim 5 further including one or more work-conserving means.

7. An apparatus as defined in claim 5 wherein said shaping means are shaping calendars.

8. An apparatus as defined in claim 6 wherein said work-conserving means is a weighted-fair-queuing scheduler.

9. An apparatus as defined in claim 4 wherein said aging means introduces multiple aging markers to each sequence group, an aging marker being added each time a time interval is passed without said connection being serviced.

10. An apparatus as defined in claim 4 wherein said scheduling means includes parallel shaper and weighted fair queuing means for specific service categories whereby said shaper provides a minimum rate guarantee and said weighted fair queuing means provides optimum bandwidth usage.

11. An apparatus as defined in claim 10 wherein said parallel shaping means and said weighted fair queuing means supports rate controlled backpressure for specific service categories.

12. An apparatus as defined in claim 10 wherein said specific service categories may be scheduled in either a shaper or a weighted fair queuing means in order to limit the peak cell delivery rate.

13. A method of fairly scheduling sequential events of various service categories at a queuing point in an ATM

network in order to satisfy Quality of Service guarantees, the method comprising:

placing sequential events into per sequence queues;

prioritizing said per sequence queues in sequence groups of similar service quality;

recording a timing marker for each sequence group, said timing marker representing the largest delay suffered by said sequence queue in said sequence group;

accumulating priority and timing marker data respecting each group; and

selectively servicing the sequence queue having the highest aggregate of priority and timing markers.